MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

BMF1014 – MATHEMATICS FOR FINANCE

(All sections / Groups)

11 OCTOBER 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages excluding the cover page.
2. Attempt ALL FOUR questions.
3. Write your answers in the Answer Booklet provided.
4. Mathematical formula is attached at the end of this question paper.

Question 1 (25 marks)

(a) Find an equation of the line that passing through the point (-2, 1) and is parallel to line $y = -2x + 5$. Then, sketch the line.

(6 marks)

(b) Sweet Love, a manufacturer of car perfumes, has a monthly fixed cost of RM 38,000. If the cost of producing car perfume is RM10 and each car perfume sells for RM26,

(i) What is the cost function?

(2 marks)

(ii) What is the revenue function?

(2 marks)

(iii) What is the profit function?

(3 marks)

(iv) Find the break-even point.

(6 marks)

(v) Compute the profit (loss) corresponding to production levels of 2000, 2500 and 3000 units car perfumes, respectively.

(6 marks)

Question 2 (25 marks)

(a) Perform the indicated operations:

(i) $3\begin{bmatrix}4\\1\end{bmatrix}-\begin{bmatrix}2 & 1\\0 & -3\end{bmatrix}\begin{bmatrix}1\\0\end{bmatrix}$

(4 marks)

(ii) $\begin{bmatrix}0 & 6 & -1\\3 & 4 & -2\end{bmatrix}\begin{bmatrix}0 & 5\\-1 & 3\\2 & 1\end{bmatrix}$

(5 marks)

(b) Solve the following system of equations using Cramer's Rule.

$$4x+3y+5z=27$$
$$x+6y+2z=19$$
$$3x+y+3z=15$$

(16 marks)

Continued...

Question 3 (25 marks)

(a) If the accumulated amount is RM1,160 at the end of 2 years and the rate of interest is 8% per year. Find the principal?

(4 marks)

(b) A trust fund for a child's education is being set up by a single payment so that at the end of 17 years there will be RM31,000. If the fund earns interest at the rate of 8.25% compounded monthly, how much money should be paid into the fund initially?

(6 marks)

(c) Kim deposited RM200 at the end of every month into a bank account that pays interest at the rate 6% compounded monthly. After 6 years, how much money will Kim has in her account?

(7 marks)

(d) James purchased a printer for RM1,100 and agreed to pay the loan by making monthly payments of RM59. If the store charges an interest rate of 12.2% compounded monthly, how many months will it take to pay off the debt?

(8 marks)

Question 4 (25 marks)

(a) Find the derivatives of the following functions using the appropriate techniques.

(i) $y = \dfrac{15x^2}{2x^2 + 7x - 3}$

(5 marks)

(ii) $f(x) = e^{\sqrt{x}}$

(3 marks)

(b) A television manufacturing company make 2 types of TV's. The cost of producing x units of type A and y units of type B televisions is given by $C(x, y) = 120 + x^2 + 8y^2 - 24x - 32y$. How many units of type A and type B televisions should the company produce to minimize its cost? What is the minimum cost?

(11 marks)

(c) Evaluate the following integral.

$$\int \frac{x^4}{1 - x^5}\, dx$$

(6 marks)

End of Question Page.

Subject Code: BMF1014
Subject Name: Mathematics for Finance

Summary of Principal Formulas and Terms

1. Quadratic Formula

The solution of the equation: $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)

(ii) Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

(i) Accumulated amount, $A = P(1+i)^n$, where $i = \frac{r}{m}$, and $n = mt$

(m = number of conversion periods per year)

(ii) Present value for compound interest, $P = A(1+i)^{-n}$

4. Effective Rate of Interest

$$r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$$

5. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ (S = future value of ordinary annuity of n payments of R dollars periodic payment)

6. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$ (P = present value of ordinary annuity of n payments of R dollars periodic payment)

7. Amortization Formula

$$R = \frac{Pi}{1-(1+i)^{-n}}$$ (R = periodic payment on a loan of P dollars to be amortized over n periods)

8. Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1}$$ (R = periodic payment required to accumulate S dollars over n periods)

9. Basic Rules of Differentiation

(a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x)=0$

(b) Power rule : If $f(x)$ is x^n, then $f'(x)=nx^{n-1}$

(c) Constant multiple rule: $\frac{d}{dx}[cf(x)]=cf'(x)$ (c is a constant)

(d) Sum rule: $\frac{d}{dx}[f(x)\pm g(x)]=f'(x)\pm g'(x)$

(e) Product rule: If $f(x)=u(x)\cdot v(x)$, then $f'(x)=u(x)v'(x)+v(x)u'(x)$

(f) Quotient rule: $f'(x)=\frac{d}{dx}\left[\frac{u(x)}{v(x)}\right]=\frac{v(x)u'(x)-u(x)v'(x)}{[v(x)]^2}$

(g) Chain rule: $\frac{d}{dx}\{g[f(x)]\}=g'[f(x)]f'(x)$

(h) General power rule: $\frac{d}{dx}[f(x)]^n=n[f(x)]^{n-1}f'(x)$

(i) Exponential function: $\frac{d}{dx}(e^u)=e^u[u'(x)]$

(j) Logarithmic function: $\frac{d}{dx}(\ln u)=\left(\frac{1}{u}\right)[u'(x)]$

10. Basic Rules of Integration

(a) Indefinite integral of a constant: $\int k\ du=ku+C$

(b) Power rule: $\int u^n\,du=\frac{u^{n+1}}{n+1}+C$

(c) Constant multiple rule: $\int kf(u)\ du=k\int f(u)\ du$ where k is a constant

(d) Sum rule: $\int[f(u)\pm g(u)]\,du=\int f(u)du+\int g(u)du$

(e) Exponential function: $\int e^u\,du=e^u+C$

(f) Logarithmic function: $\int\left(\frac{1}{u}\right)du=\ln u+C$

11. Determining Relative Extremas

$D(x,y)=f_{xx}f_{yy}-(f_{xy})^2$

If D > 0 and f_{xx} > 0, relative minimum point occurs at (*x*, *y*).
If D > 0 and f_{xx} < 0, relative maximum point occurs at (*x*, *y*).
If D < 0, (*x*, *y*) is neither maximum nor minimum.
If D = 0, the test is inconclusive.